

REMARKS

This Amendment responds to the Office Action mailed November 24, 2004 in the above-identified application. Based on the foregoing amendments and the following comments, careful reconsideration and allowance of the application are respectfully requested.

Claims 1-87 were previously pending in the application. By Examiner's amendment, claims 20-34 and 70 were cancelled. Applicant confirms the cancellation of claims 20-34 and 70 without prejudice to the subject matter thereof. By this Amendment, claims 1, 2, 6, 8, 35, 37-42, 45, 52-61, 63, 64, 67-69, 71-73, 79, 82 and 87 are amended, and claim 36 is cancelled without prejudice. No new matter has been added. Accordingly, claims 1-19, 35, 37-69 and 71-87 are pending in the application, with claims 1, 35, 67, 73, 79, 82 and 84 being independent claims. Previously independent claim 68 has been rewritten to depend from claim 67.

The Examiner has rejected claims 1-9, 12-19, 67, 69, 73, 74, 76-78 and 82-86 under 35 USC §102(e) as anticipated by Raynal et al. (US 6,643,389). Claims 35, 64-66 and 68 are rejected under 35 USC §102(e) as anticipated by Tschudi et al. (US 6,785,407). Claims 10, 11 and 75 are rejected under 35 USC §103(a) as unpatentable over Raynal in view of Tschudi. Claims 36-63, 71, 72, 79-81 and 87 are rejected under 35 USC §103(a) as unpatentable over Tschudi in view of Raynal. The rejections are respectfully traversed.

Raynal discloses a two-dimensional array of capacitive fingerprint sensors, each cell of the array having a pair of conductors (Figs. 2 and 3). In particular, each cell 21 shown in Fig. 3 includes a first conductor plate 35 and a second conductor plate 37 supported on a semiconductor substrate (col. 4, lines 46-48). The array is smaller in one dimension than the fingerprint and requires assembling partial fingerprint images into a complete fingerprint image (col. 2, line 65 to col. 3, line 6). A mouse device positioned adjacent to the array in the path of fingerprint movement provides fingerprint speed information to the scan control unit (col. 3, lines 12-17 and col. 3, lines 50-60).

Tschudi discloses a fingerprint sensor mounted on a U-shaped member (Fig. 2 and col. 3, lines 49-52). The sensor may be a single row or a double row of sensor elements. The sensor elements may be pressure or temperature sensors, but preferably are electrical conductors to measure conduction, impedance or capacitance on different parts of the fingerprint (Fig. 1A and 1B and col. 2, lines 58-63). Velocity is measured by correlating similar features measured at different times at different sensor elements (col. 3, lines 34-40 and col. 4, lines 15-20). Fig. 4 of

Tschudi shows an embodiment including sensor arrays 40, 41 and 42, apparently mounted on separate substrates (col. 4, lines 5-21).

Tschudi refers to International Publication No. WO 98/58342 for a detailed description of the sensor lines (col. 3, lines 41-43). The referenced International Publication was submitted in an Information Disclosure Statement mailed August 2, 2002 (the PTO 1449 contained a typographical error in the publication number, but insofar as known to Applicants, the referenced document was submitted with the Information Disclosure Statement). A copy of International Publication No. WO 98/58342 is enclosed for the convenience of the Examiner. As described in WO 98/58342, the sensors 1 are electrical conductors which may be surrounded by an electrically conducting material 2 that is used to provide a reference potential (page 3, line 28 to page 4, line 2). In the case of capacitance measurements, an insulating layer is provided between the conductor ends and the fingerprint (page 7, lines 24-26).

Amended claim 1 is directed to image sensing apparatus comprising an image pickup plate disposed generally laterally with respect to a direction of movement of an object, and a plurality of image drive plates in spaced relation to said image pickup plate to define a plurality of sensor gaps between respective image drive plates in said image pickup plate, wherein features of the object passing over said sensor gaps produce a change in capacitance between respective image drive plates and said image pickup plate.

An embodiment of the claimed image sensing apparatus is shown in Fig. 6 of the present application. Drive plates 114 are arranged substantially parallel to each other and substantially orthogonal to pickup plate 116. Drive plates 114 are separated from pickup plate 116 by sensor gaps 118, over which the object to be imaged is swiped.

Raynal does not disclose or suggest an image sensing apparatus including an image pickup plate and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate, as required by amended claim 1. Instead, Raynal discloses an image sensor wherein two conductors are associated with each cell of the sensor array. Amended claim 1, by contrast, recites an image pickup plate associated with a plurality of image drive plates. The claimed image sensing apparatus requires only a single set of image sensing electronics in systems which have a single image pickup plate. It should be apparent that an image sensor having an image pickup plate associated with a plurality of image drive plates, as claimed, is very different from

an image sensor wherein each cell of the array includes two conductors. The image sensor structures are very different, and the required excitation and sensing circuits are very different. For at least these reasons, amended claim 1 is clearly and patentably distinguished over Raynal.

The Tschudi patent does not provide the teachings that are lacking in Raynal. Tschudi and the referenced International Publication do not disclose or suggest image sensing apparatus including an image pickup plate and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps, as required by amended claim 1. Instead, Tschudi discloses an image sensor wherein capacitance is measured between the finger end and conductor ends of the sensor or between the sensor ends and the surrounding reference conductor, through the finger. Accordingly, the Tschudi patent and the referenced International Publication do not disclose or suggest image sensing apparatus as defined by amended claim 1.

Further, the combination of Raynal and Tschudi does not disclose or suggest image sensing apparatus as claimed, since neither reference individually discloses an image sensor as defined by amended claim 1. For these reasons, amended claim 1 is clearly and patentably distinguished over Raynal, taken individually or in combination with Tschudi. Claims 2-19 and 69 depend from claim 1 and are patentable over Raynal, taken individually or in combination with Tschudi, for at least the reasons discussed above in connection with claim 1.

Amended claim 35 is directed to a fingerprint sensing system comprising an image sensor including an array of capacitive sensors for capacitive sensing of ridge peaks and ridge valleys of a fingerprint on a moving finger, a finger sensor for sensing a speed of the finger as it moves across the image sensor and a sensor circuit for excitation of the image sensor with image drive signals and for detection of image signals in response to the image drive signals, for excitation of the finger sensor with finger drive signals and for detection of finger signals in response to the finger drive signals, and for coordinating the image signals and the finger signals to provide a fingerprint image. The image sensor comprises an image pickup plate disposed generally laterally with respect to a direction of movement of the finger, and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate, wherein ridge peaks and ridge valleys of the fingerprint passing over the sensor gaps produce a change in capacitance between respective image drive plates and the image pickup plate.

As discussed above in connection with claim 1, neither Tschudi nor Raynal discloses or suggests an image sensor comprising an image pickup plate and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate, as required by amended claim 35. For these reasons and for the reasons discussed above in connection with claim 1, amended claim 35 is clearly and patentably distinguished over Tschudi, taken individually or in combination with Raynal.

Claims 37-66, 71 and 72 depend from claim 35 and are patentable over Tschudi, taken individually or in combination with Raynal for at least the reasons discussed above in connection with claims 1 and 35.

Claim 67 is directed to a fingerprint sensing method, comprising capacitively sensing ridge peaks and ridge valleys of a fingerprint on a swiped finger with an array of capacitive sensors and providing image signals representative of a line of the fingerprint, the array of capacitive sensors comprising an image pickup plate and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate, and acquiring from the array of capacitive sensors image signals representative of multiple lines of the fingerprint to provide a fingerprint image.

As discussed above in connection with claims 1 and 35, neither Tschudi nor Raynal discloses an array of capacitive sensors comprising an image pickup plate and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate, as required by amended claim 67. For these reasons and for the reasons discussed above in connection with claims 1 and 35, claim 67 is clearly and patentably distinguished over Tschudi, taken individually or in combination with Raynal. Amended claim 68 depends from claim 67 and is patentable over Tschudi in view of Raynal for at least the reasons discussed above in connection with claims 1, 35 and 67.

Amended claim 73 is directed to a capacitive sensor comprising a pickup plate and a plurality of drive plates in spaced relation to said pickup plate to define an array of sensor gaps between respective drive plates and the pickup plate, the pickup plate and the plurality of drive plates being substantially coplanar, wherein an object passing above the array of sensor gaps produces a change in capacitance between respective drive plates and the pickup plate.

As discussed above in connection with claim 1, neither Raynal nor Tschudi discloses a capacitive sensor including a pickup plate and a plurality of drive plates to define an array of sensor gaps between respective drive plates and the pickup plate, as required by amended claim 73. For these reasons and for the reasons discussed above in connection with claims 1, 35 and 67, amended claim 73 is clearly patentable over Raynal, taken individually or in combination with Tschudi.

Claims 74-78 depend from claim 73 and are patentable over Raynal in view of Tschudi for at least the reasons discussed above in connection with claims 1, 35, 67 and 73.

Amended claim 79 is directed to a fingerprint sensing system comprising an image sensor including an array of capacitive sensors for capacitive sensing of ridge peaks and ridge valleys of a fingerprint on a moving finger, a finger sensor for sensing the speed of a finger as it moves across the image sensor, wherein the image sensor and the finger sensor are fabricated on a single substrate, and a sensor circuit, separate from the substrate, for operating the image sensor and the rate sensor to provide fingerprint data.

Raynal discloses a fingerprint sensing system including an array 13 and a mouse device 19 positioned adjacent array 13 to provide finger speed information (Fig. 1 and col. 3, lines 36-37 and lines 50-53). Tschudi discloses in Fig. 4 a fingerprint sensor including sensor arrays 40, 41 and 42 on separate substrates. Accordingly, neither Raynal nor Tschudi discloses a fingerprint sensing system wherein an image sensor and a finger sensor for sensing the speed of a finger are fabricated on a single substrate, as claimed. For these reasons, amended claim 79 is clearly patentable over Tschudi in view of Raynal. Claims 80 and 81 depend from claim 79 and are patentable over Tschudi in view of Raynal for at least the reasons discussed above in connection with claim 79.

Claim 82 is directed to fingerprint sensing apparatus comprising an image sensor including an image pickup plate disposed generally laterally with respect to a direction of movement of a finger, and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate, wherein the image pickup plate and the plurality of image drive plates are fabricated on a substrate, and a separate circuit, separate from the substrate, for excitation of the image sensor with image drive signals and for detection of image signals generated by the image sensor in response to the image drive signals.

As discussed above in connection with claim 1, Raynal does not disclose or suggest an image sensor comprising an image pickup plate and a plurality of image drive plates in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate, as required by amended claim 82. Tschudi is similarly lacking in any teaching of an image sensor as claimed. For these reasons and for the reasons discussed above in connection with claims 1, 35, 67 and 73, amended claim 82 is clearly and patentably distinguished over Raynal, taken individually or in combination with Tschudi. Claim 83 depends from claim 82 and is patentable over Raynal, taken individually or in combination with Tschudi, for at least the reasons discussed above in connection with claim 82.

Claim 84 is directed to a fingerprint sensor comprising a substrate, an image pickup plate fabricated on the substrate and disposed generally laterally with respect to a direction of movement of a finger, and a plurality of image drive plates fabricated on the substrate in spaced relation to the image pickup plate to define a plurality of sensor gaps between respective image drive plates and the image pickup plate.

Claim 84 is patentable over Raynal, taken individually or in combination with Tschudi, for the reasons discussed above in connection with claims 1, 35, 67, 73 and 82. Claims 85-87 depend from claim 84 and are patentable over Raynal, taken individually or in combination with Tschudi, for at least the reasons discussed above in connection with claim 84.

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CONCLUSION

A Notice of Allowance is respectfully requested. The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in condition for allowance.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Respectfully submitted,
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